A NEW SPECIES OF FOSSIL *PTINUS* FROM FOSSIL WOOD RAT NESTS IN CALIFORNIA AND ARIZONA (COLEOPTERA, PTINIDAE), WITH A POSTSCRIPT ON THE DEFINITION OF A FOSSIL

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Abstract

Fossil specimens of *Ptinus priminidi*, new species, are described; they were collected from 3 fossil wood rat (*Neotoma* sp.) middens in the arid mountains of southeastern California and western Arizona. The ptinid specimens lived approximately 12,300, 13,400, and 30,000 years before the present, based on radiocarbon analysis of plant debris found in the midden. Various interpretations of the term "fossil" are discussed. For catalogue purposes, "fossil" may be defined as: A specimen, a replacement of a specimen, or the work or evidence of a specimen that lived in the past and was naturally preserved rather than buried by man.

Ptinid beetles are scavengers of plant and animal matter. Some species are well-known pests of man's stored food products and have been carried to all parts of the world, but most species occur in natural habitats where they live in dead plant matter or in the nests of insects, birds, and mammals. Of all mammal nests, those of rodents have been mentioned most frequently in literature. Perhaps this is because rodents are such prodigious storers of food and thereby provide food for ptinids. Also, the ptinids could be feeding on hair, skin or other body remains of the rodents themselves, and they are known to feed on rodent dung. Linsley (1944) reviewed the subject of natural sources, habitats, and reservoirs of insects associated with stored food products and included a list of ptinids and their associated bird and mammal nests and food caches.

Fossilized ptinids have recently been found in fossil wood rat middens. A midden is a refuse heap, marking the site of a primitive habitation. Wood rats or pack rats, *Neotoma* spp., usually make a den in rock crevices where the nest of soft plant material is constructed. The wood rat midden consists of plant debris, many elements of the local fauna that live and die in the wood rat's den, faunal materials gathered from outside the den, and bones and fecal pellets of the wood rat. Fossil middens, having all this material cemented together by urine, are preserved for thousands of years in crevices protected from natural weathering agents. The contents of a midden can be separated by submerging the midden in water to break down the cement of urine. Some of the plant matter can then be subjected to radiocarbon age analysis, and all contents can be studied to determine preexisting biota (Van Devender and King 1971).

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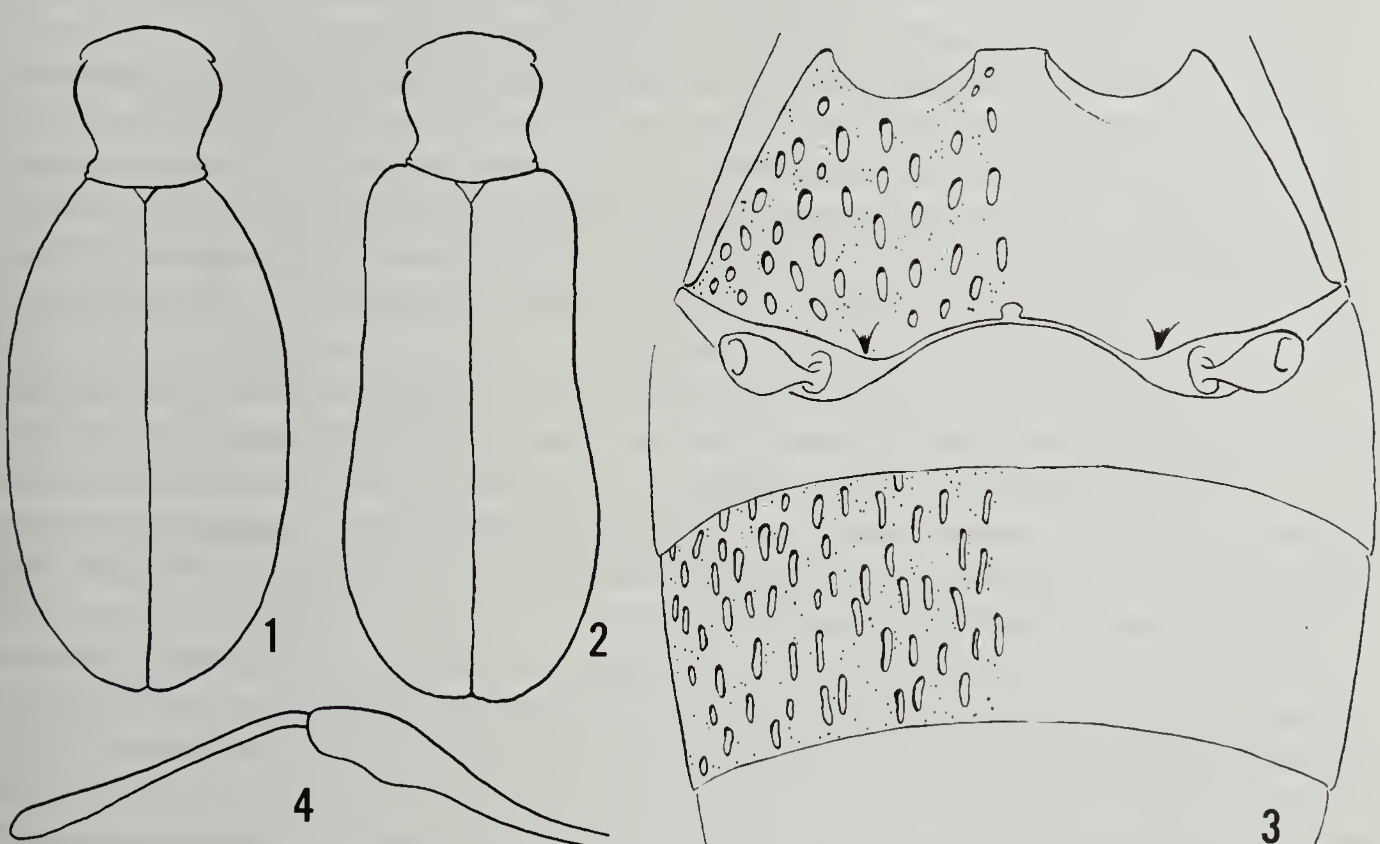
Three families of beetles, including Ptinidae, were recovered from a 11,500—12,500 year old *Neotoma* midden in the Maravillas Canyon of western Texas. The ptinids were *Niptus abstrusus* Spilman, 2 right elytra and 1 left elytron, and *Ptinus* sp., 1 pronotum (Ashworth 1973).

More recently more fossil ptinids have been discovered, this time from localities in the dry mountains of San Bernardino County of California and Yuma and Mohave Counties of Arizona. They are much older middens, based on radiocarbon analysis of included yucca and juniper twigs; the first is more than 12,000 years old, the second more than 13,000, and the third more than 30,000. The specimens, representing a new species, were collected by Thomas R. Van Devender and were submitted for study by Allan Ashworth. The ptinid specimens are in various stages of completeness. All segments of all antennae, except for basal articles in a few specimens, are missing. Legs are rarely present. Unfortunately only a few appressed setae are present on specimens; dorsal setal arrangements are often an important characteristic. A few specimens have a varnishlike coating because of the remains of dried urine, some are slightly distorted, and some have appendages appearing slenderer than usual because of the absence of setae. Otherwise, these ptinids look like complete, recently collected specimens that have had a bit of rough treatment. Only the hard parts of the exoskeleton persist. Each abdomen, when available, was examined for presence of genitalia, but only the sternites were present. I could not find evidence of dermestid beetle damage on external parts, and dermestids were not present in the fossil midden. Perhaps the internal parts and even the abdominal tergites had been destroyed by an organism, perhaps by a fungus.

It is not possible at this time to determine whether this species is extinct. I have merely determined that it is a new species. Perhaps it still lives in the western United States, perhaps even with extant wood rats.

Ptinus (*Ptinus*) *priminidi* Spilman, **new species**

Holotype, female. Lengths: pronotum, .75 mm; elytra, 2.50 mm. *Head.* Eye large, moderately protruding, ventral border straight. Area ventral to eye with curved, sharply incised suture that continues curving outline of anterior and posterior border of eye. *Antennae* (only 4 right articles present). Articles relatively slender; ratio of lengths, with length of article 2 used as the standard: 1—2.1, 2—1.0, 3—1.4, 4—1.8. *Pronotum* (fig. 1). In dorsal view, lateral borders strongly excurved on anterior 2/3 and strongly constricted on posterior 1/3, constriction gradual, not sharply delimited; anterior border strongly excurved; posterior border moderately excurved. Surface with pair of strongly rounded gibbosities; sculptured over-all, without bare areas; with vague longitudinal groove medially; anterior and posterior margins formed by transverse row of coarse punctures that become coalesced laterally to form a continuous, sharp, deep sulcus laterally and ventrally; anterior margin wider than posterior margin; margins with minute granules; surface between granules composed of punctures that are sharply delimited, irregular in shape, and often coalesced; the granules therefore often seem to be quite elevated. Ratio of measurements, with width of constriction used as the standard: width of constriction, 1.00; width anteriorly, 1.40; width posteriorly, 1.20; length medially, 1.60. *Elytra* (fig. 1), In dorsal view oval, sides evenly excurved, widest at half length; humeri rounded; length 1.75 times width. Striae not impressed, composed of sharply incised, coarse punctures that are slightly longer than broad, distance between most punctures in a stria equal to 1—1 1/2 times length of puncture, but punctures slightly smaller and closer together on anterior and lateral parts of elytra; width of puncture approximately 1/3 width of interval in central part of combined elytra; each puncture with minute granule on anterior border and on each lateral border. Intervals mostly flat, slightly convex on lateral areas of elytra, without punctures, each interval with row of fine granules, number of granules on interval slightly less than number of punctures in adjacent stria. *Metasternum* (fig. 3). Width (at posterior border) 3.0 times length (distance between posterior border of mesocoxal cavity and midpoint of posterior border). Posterior border broadly incurved between coxae, at middle with a shallow U-shaped emargination; angulate at medial limit of coxae then slanted anteriorly to lateral border; with a prominent cone-shaped projection slightly lateral to each angulation. Surface with dense oval deeply incised punctures, and with very dense minute granules, each granule with puncture on apex. *Legs.* Left femora and tibiae of all legs, 3 segments of left metathoracic leg, and femur of right prothoracic leg present; legs very long and slender (fig. 4), femora very distinctly expanded apically. *Abdomen.* Visible sternites with the following length ratios, with the 2nd used as the standard: 1—0.58; 2—1.00; 3—0.74; 4—0.26; 5—0.68; the ratio of anterior width to length of 2nd visible sternite is 2.30 to 1. Sternite 2 (fig. 3) with dense, distinctly incised, deep linear punctures, each linear puncture with a minute puncture on anterior border or just anterior to border; surface between linear punctures with dense minute granules, each granule with puncture on apex. Sternite 1 with linear punctures much shorter than on 2, almost oval. Sternite 3 with linear punctures slightly narrower than on 1. Sternite 4 with punctures short, approximately oval, with only a few granules or fine punctures on surface. Sternite 5 with sparse small punctures and granules.



Figs. 1-4, *Ptinus priminidi*, fossil. 1) holotype female, outline, dorsal view. 2) allotype male, outline, dorsal view. 3) metasternum and first two visible abdominal sterna, ventral view, holotype female. 4) left metathoracic femur and tibia, holotype female.

Allotype, male. Lengths: pronotum, 0.8 mm; elytra, 2.6 mm. Surface sculpture as in holotype; differing principally in the eyes and in being much more slender. *Head.* Eyes very large, protruding, rounded ventrally, extending almost to maxillary emargination on ventral surface of head capsule. *Pronotum* (fig. 2). In dorsal view, narrow, lateral borders moderately excurved on anterior 2/3. Surface with pair of weakly rounded gibbosities. Ratio of measurements, with width of constriction used as the standard: width of constriction, 1.0; width anteriorly, 1.1; width posteriorly 1.1; length medially, 1.2. *Elytra* (fig. 2). In dorsal view narrow, sides almost straight in anterior 2/3 and weakly divergent posteriorly; humeri obvious and subangulate; widest at posterior 1/3. Ratio of measurements, with width at posterior 1/3 used as the standard: width at humeri, 0.8; width at posterior 1/3, 1.0; length, 2.1. *Metasternum.* Width (at posterior border) 1.2 times length (distance between posterior border of mesocoxal cavity and midpoint of posterior border). *Legs.* Only left metafemur and metatibia present; very slender.

Paratypes, similar to holotype and allotype except in the absence of body parts, presence or absence of appressed setae on the pronotum and elytra, and proportions of the elytra. The paratypes have been numbered. Paratypes 1-11 and 13 are females, having elytral proportions (length divided by combined widths) 1.67 to 1.80, averaging 1.75. Paratype 12 is a male, having elytral proportions 2.10.

Holotype, female, USNM 73755, and allotype, male: Tunnel Ridge midden #5A, Whipple Mts., elevation 365 meters, 34°13′N–114°22′W, San Bernardino Co., California, dated 12,330 ± 350 years B.P. (A-1582) and 12,670 ± 260 years B.P. (A-1550). Paratypes number 1-12: Burro Canyon midden #1, level 6, Kofa Mts., elevation 853 meters, 33°24′N–114°01′W, Yuma Co., Arizona, dated 13,400 ± 250 years B.P. (A-1315). Paratype number 13: Artillery Mts. midden #3, Artillery Mts., elevation 720 meters, 34°22′N –113°37′W, Mohave Co., Arizona, dated greater than 30,000 years B.P. (A-1100). All specimens were collected by Thomas R. Van Devender and are deposited in the U. S. National Museum of Natural History.

The numbers in parentheses in the foregoing paragraph indicate records in the University of Arizona radiocarbon analysis. Analysis A-1550 is based on *Yucca brevifolia* Engelmann; all others are based on *Juniperus* spp. Artillery Mts. midden #3 was described and analyzed and its location illustrated by Van Devender and King (1971); however, this midden, called midden C. in that article, should now be called midden #3, according to a recent communication from Van Devender.

In extant species the characteristics of the subgenus *Ptinus* are as follows: sexual dimorphism present, that is, male elytra elongate and parallel sided, and female elytra elliptical with the sides strongly arcuate; subbasal pronotal constriction uninterrupted; tomentose cushions on pronotum absent. Of course, the possible presence of tomentose cushions can not be determined on these fossil specimens.

The most obvious feature of this new species is the size of the pair of cone-shaped projections on the posterior border of the metasternum, just anterior to each metacoxa (fig. 2). They are larger than on any other species of *Ptinus* known to me. The projections are never mentioned in descriptions of ptinids and the punctures of the metasternum and abdominal sternites are seldom mentioned because they are usually hidden by the very dense appressed setae that cover the entire ventral surface. The dense setae of any ptinid should be removed in future taxonomic studies; new or unstudied structures might lie hidden but within easy reach.

P. priminidi is similar to *P. fur* (Linnaeus) in the pronotal and elytral proportions and in the punctures of the abdominal sternites; in *P. fur* the punctures of the metasternum are larger, the metasternal processes are absent, the eyes are smaller, and arcuate groove below the eye is absent in the female.

Postscript

Are these ptinid specimens and this species to be considered fossil or nonfossil? The question is not easily answered. Most of the beetle, at least, most of the exoskelton is present; it is not a substitute, not a replacement or impression as in the Florissant insect fossils. Perhaps we usually think of an insect fossil as being a permineralization or impression in stone or in amber. These ptinid specimens, I suppose, are similar to the mammoth elephants naturally preserved in a deep-freeze condition in the Arctic permafrost, similar to many of the animals preserved in the La Brea tar pits of southern California, and similar to the mummified giant ground sloth bones and dung from arid caves of the southwestern United States. W. Dwight Pierce (1950) gave many examples of fossilizations that are problems, such as, preservation in Arctic ice, in amber, in thermal spring lime deposits, in peat, and in tar pits. Unfortunately, to his own question of when does a living thing become a fossil, he said that no one can give an adequate answer.

The question of what constitutes a fossil is not academic for North American Coleopterists; we will have to place such species in our forthcoming catalogue in a fossil or nonfossil section, as in the old Leng catalogue, or even, as has been proposed, in a different section, called subfossil. If the category subfossil were used, the following 3 definitions, based on time, would have to be used, according to some paleontologists: a fossil is a specimen, a replacement of a specimen, or the work or evidence of a specimen that had lived in the Pleistocene or before; a subfossil is a specimen, etc., that lived after the Pleistocene but before recorded history; a nonfossil specimen lived during recorded history. The Pleistocene is usually agreed to have ended about 10,000 years B.P. (Before Present), but the beginning of recorded history is not so easily determined. In Egypt and Mesopotamia it probably began 5,000-6,000 years B.P., but in Arizona it began only about 450 years B.P. Surely, the use of the subfossil category in insects would only cause confusion.

What then of the fossil and nonfossil categories? The fossil definition most often recommended to me by paleontologists is admittedly and purposefully vague: a fossil is a specimen, a replacement of a specimen or the work or evidence of a specimen that lived in the past, was naturally preserved, has been dug up, but was not buried by man (usually). The phrase "lived in the past" is interpreted with difficulty, of course, but it excludes the so-called 'fossils-while-you-wait' that can occur when an animal today falls into a tar pit or is covered with lime deposits from a thermal spring. The phrase "not buried by man" would reject as fossils those specimens recently put in the ground for any purpose, but the inclusion of "(usually)" allows acceptance of anciently buried peoples and the insects that might have been in the stored foods buried with a corpse for an after life, or the boll weevil in stored Mexican cotton dated 1,000 years B.P. With fossil and nonfossil lists, a species could be included in either one or both.

Finally, 2 other methods of solving the cataloguing problem have been suggested. First, instead of having fossil and nonfossil lists, we could have lists of extant and extinct species. With that system, a species would be placed in 1 or the other list; however, if a species in the extant list also has fossil representatives, that undoubtedly should be indicated. Second, the fossil question could be avoided completely by having Recent and pre-Recent lists or by having only 1 list and indicating geological time or radiocarbon age beside each specific name.

The fossil and nonfossil lists, even though they present some problems, seem best to me.

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